



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## THE ECONOMIC EFFECTS OF SHIP CANALS.

Much has been written concerning the ship canals of the world as great works of engineering; much, too, on their political and military importance; but of the part they have played in the great economic changes, the result of the marvelous development of transport industries during this last half century, it is not so easy to find definite or satisfactory accounts. At the same time vague and indefinite statements frequently made indicate that their economic importance has been significant; and, in fact, it is only as they are influential in this way that they become commercially profitable undertakings. The attempt is made in this paper to trace with some degree of precision these economic effects, showing how, in consequence of the canals, important changes have been made in business machinery, in business methods, in producing and marketing commodities, and in general economic development.

The ship canals do not form a connected part of the world's transportation system, and in consequence the economic results of each are, in the main, independent of all other canals. Furthermore, the economic importance of the different canals presents the widest variations. Each opens the way for the creation of many and extensive carrying routes; but, while the influence of some has been merely local, the consequences of others have been felt throughout the commercial and industrial world. These conditions suggest the natural method of treatment to be a consideration of each canal separately, tracing so far as possible the economic effects that have resulted from its existence.

The Amsterdam and Manchester canals, each constructed to serve the needs of a single port, do not present the possibilities of any large and general economic results. The Welland, Corinth and Kiel canals have a larger field of

possibilities ; but their actual consequences have as yet been small. The results of these less important canals are therefore but briefly considered in this paper. The examination of the vastly more important and significant results of the Suez and St. Mary's Falls canals will comprise the larger part of this study.

In a country as well supplied with smaller canals as Holland is, it was natural that the idea of a ship canal should present itself to Amsterdam, when the shallowness of the Zuyder Zee and other difficulties of approach were causing her to lose trade to her rival, Rotterdam. The idea soon took practical form, and in 1826 the Helder Canal, with an eighteen-foot channel, offered an easier approach to the Dutch port. With the development of the shipping industry, the dimensions of this canal became inadequate after a few decades, while its length (fifty miles) and the difficult entrance in the passes of the Texel proved additional disadvantages. To maintain the commercial position of Amsterdam the construction of a new and larger canal, built by the shortest line to the sea, was decided on ; and in 1876 the North Sea Canal, fifteen and one-half miles in length, and twenty-three feet in depth, was opened for use.

The effect of the new canal on the commerce of Amsterdam was instantaneous. For twenty years the tonnage statistics for shipping at that port had shown an almost complete stagnation, while at Rotterdam the shipping had trebled. In six years after the new canal was opened the tonnage entering and clearing at Amsterdam had more than doubled,—rising from 802,000 tons in 1876 to 1,734,000 tons in 1882. In the former year the Amsterdam shipping was but little over one quarter that at Rotterdam; in the latter year it was almost a half. Since 1882, however, the increase has been at a much slower rate, while the continued rapid upward movement of the Rotterdam figures show that there is no falling off in the general trade.\* Evidently the

\* See Table II.

larger and deeper draught vessels now constructed find the twenty-three-foot channel too shallow, and an enlargement of the canal will be necessary to enable Amsterdam to retain even her existing position.

The Manchester Ship Canal resembles the Amsterdam Canal in connecting a large city with the open sea, and in being constructed with a view to its effects on the city at its inland terminus. There is the difference, however, that the promoters of the English canal aim not simply at retaining and developing an already existing trade, but at creating a new port. The expectation of the promoters and of the corporation of Manchester which has bonded itself heavily to secure the completion of the canal, is that the raw materials for Manchester manufactures will be brought via the canal, this route saving the heavy expenses connected with the transfer to the railroad at Liverpool. It is perhaps too early to say whether these expectations will be realized; although the estimate of a traffic of 3,000,000 tons within two years of opening has not been fulfilled, a large trade has been developed. The canal was opened on January 1, 1894, and during the first year 1280 sea-going vessels and 1660 boats for coast traffic came up to Manchester. For the nine months ending September, 1896, the traffic was 1,300,000 tons, an increase of 350,000 tons over the corresponding period of the year before. This development within three years of a trade approaching that of Amsterdam in volume, is not without significance, and with a continued increase, Manchester in a few years will become an important shipping port.\*

Like the Manchester Canal, the Corinth and Kiel canals have not produced immediate effects equal to the anticipations of their promoters. The Corinth Canal was opened in October, 1893, and the total traffic at the end of December,

\*From the investor's point of view, the results of the Manchester Canal are more discouraging because of the heavy expense of construction, it being almost equal to the cost of the Suez Canal.

1895 (twenty-six months), had been but 4589 ships with a tonnage of 596,000 tons. The first year's operation of the Kiel Canal between the Baltic and North Seas showed a record of 7500 steamers and 9300 sailing vessels; but these were mostly small vessels, and the receipts from tolls were under 900,000 marks, against an estimate of 5,000,000 marks.

It is evident, however, that these canals have been in operation too short a time for a full development of their possibilities. The future may demonstrate that these routes offer a net advantage to shipping on account of the saving in distances and the greater safety from shipwreck; and a considerable traffic may develop with important economic results. The Welland Canal does not seem at first sight to offer this hopeful outlook. The present fourteen-foot channel has been in use since 1887, yet the traffic does not exceed 1,000,000 tons a year. But a deepening of the channel and the enlargement of the locks, so as to reduce the number, might result in a considerable increase in the traffic.

There may be latent possibilities in the traffic of each of these canals we have been considering; but thus far the great bulk of the trade they were intended to get, remains undiverted from old routes, little new trade has been developed, and no important economic results have appeared. This however is not the case with the Suez and Saint Mary's canals.

#### THE SUEZ CANAL.

In December, 1858, a company was formed to undertake M. de Lesseps' audacious scheme of connecting the Mediterranean and Red Seas; in the following spring, work was commenced, and in 1869 the Suez Canal opened a new water route to the East.

It takes but a glance at the statistics of traffic to notice the enormous difference between the trade that has developed through the Suez Canal, and that of the canals

already considered. Beginning in 1870, with 486 vessels, having a tonnage of 436,000 tons, there was a steady increase until 1875, when it had reached nearly fifteen hundred ships and over 2,000,000 tons. After a few years of quiescence came a second period of rapid increase, from 1880 to 1883, in the latter year the figures of 3300 ships and 5,800,000 tons being reached. Since then there has been a slowly increasing tonnage, reaching the maximum figure of 8,700,000 tons in 1891, but falling off somewhat since that year. In 1896 the figures were 3409 ships with a tonnage of 8,594,307.

The importance of these figures may be made clearer by recalling the fact that the foreign tonnage entering at the port of New York has rarely exceeded 7,500,000 tons in any year, and that the foreign tonnage for all the ports of the United States, both entering and clearing, is about 35,000,000 tons. That is, the traffic through the Suez Canal, measured by volume, is almost a quarter of the total foreign trade of the United States. But if measured by value, the importance of the canal traffic is seen to be much greater. The imports and exports of India, via the Suez Canal, are equal in value to \$360,000,000, which is nearly one-quarter of the value of the foreign trade of the United States. As the Indian trade constitutes rather less than one-half the total traffic of the Suez Canal, the value of the whole of that traffic must be not far from a half of the foreign trade of the United States.

The development of a trade of such an extent and value by a new route within the space of twenty-five years could not but have an important and far-reaching influence on the economic interests of the world. Perhaps the most striking results of the opening of the canal route to the East were those on the machinery of trade—meaning by this term both the material appliances and the business organization of trade. One effect might have been in part anticipated. The new route saved nearly three thousand marine leagues

on the voyage from the ports of western Europe to the East, or almost half the distance to Bombay. The obvious result of the use of the new route would be that half of the vessels engaged in the Eastern trade would be out of employment. In fact, however, the change came more indirectly. Sailing vessels did not find it advantageous to use the canal, and continued on the old route around the Cape of Good Hope. But the canal, by making practicable the use of steamships in the oriental trade, brought about an even greater revolution in the character of the shipping business to the East. By the Cape route coaling places were few, and the facilities for coaling expensive; the consequence was that the enormous expense of coaling at these out-of-the-way places, with the loss of freight room from the extra space needed for coal, made the use of steamers unprofitable. But by the canal route a steamer could coal at Gibraltar, Malta, Port Said and Aden, where coal could be furnished at moderate rates; while the space saved from coal could be used to carry a larger cargo. Accordingly, a large number of new iron screw steamers were soon constructed for the trade with the East, and replaced a large percentage of the sailing vessels. It has been estimated that 2,000,000 tons of vessels were thus thrown out of employment, and the effect of this can be seen in the immediate reduction in the tonnage of sailing vessels. In 1869 the sailing tonnage in the British foreign trade was 3,600,000 tons; in 1876 it was but 3,230,000 tons.

In the construction of the new steamers for the canal trade, two lines already in existence—the Peninsular and Oriental Steamship Company, and the Messageries Compagnie—took prominent parts. But new companies also were rapidly organized, which built steamers and established new lines to the East, among which may be noted the British India Steam Navigation Company, the Clan Line, the Austro-Hungarian Lloyds Company, the Italian Steam Navigation Company, and the Rubbotino Company, of Genoa. It is not possible to get at the amount of ship building made

necessary by the change in the kind of ships used in the eastern trade; but some idea of the importance of the change may be seen by noting the fact that the total steam tonnage in the British foreign trade increased from 650,000 tons in 1869 to 1,500,000 tons in 1876. It would, of course, be possible to learn the number and tonnage of ships now engaged in the trade between Europe and the East, but to account for all of this by the Suez Canal would be to exaggerate its effects. Improvements in marine engines and in the construction of steamers make much longer steamer voyages possible to-day than were possible in 1870, as is shown by the lines to Australia and across the Pacific Ocean. It is, therefore, certain that if no Suez Canal had been built, there would have been by this time steamers in the Eastern trade. But the change would have come at a much later period, and sailing vessels would continue to carry a large, perhaps a dominant share of the traffic. The effect of the Suez Canal was to make the transition from sail to steam sharp and decisive, and to bring it about in the decade 1870-1880.

One change in the shipping industry that was expected from the construction of the Suez Canal has not been realized. It was predicted that the geographical advantage given to the Mediterranean ports by the new route would soon enable them to regain the position they had held in the Middle Ages as the carriers of eastern produce to the markets of Europe. In England it was felt that the canal would seriously threaten British maritime supremacy. But the results have been otherwise. It was only in England that the capital was at hand to build the large screw steamers which alone could profitably use the canal; and from the start three-fourths of the vessels using the canal have been British. Of late years there has been a slight decline in the percentage of British vessels, but this has been due not to an increase in the ships of southern European nations, but to an increase in German, Dutch and Belgian vessels.



But while the carrying trade is still in British vessels, a much larger and a growing share of the traffic is carried from the East directly to the continent, and England has declined in relative importance as a warehousing and distributing point for eastern goods. Under the old régime of sailing vessels around the Cape, when voyages from India took a good part of a year, and the time of arrival could not be calculated on within a month or two, it was necessary that large stocks of goods should be kept on hand to enable dealers to meet the varying demand for their goods. Steamers by way of the Suez Canal make the voyage in thirty days, and the time of their arrival can be regulated within a day. Shorter voyages and punctuality of arrivals make it possible for local dealers both in England and on the Continent to order directly from the East, and the change in the method of this business rendered useless to a large extent the immense warehouses at London, Liverpool and other English ports. A few statistics will show the extent to which direct trade between the East and the Continent has taken the place of trade via England. In 1870 the value of exports from India to the United Kingdom was nearly \$70,000,000, to the rest of Europe \$13,000,000; in 1893-94 the value of Indian exports to the United Kingdom was \$93,000,000, to other European countries \$85,000,000. In other words, while the total export trade of India and the total exports to Europe have doubled in value, within twenty-three years, and the exports to European countries other than Great Britain have multiplied sixfold, the exports from India to the United Kingdom have increased but 40 per cent. The proportion of Indian exports to Europe, that are landed first in the United Kingdom, declined from 83 to 53 per cent.

This change in the direction of trade has not been simply the transfer of the distributing points from England to the Mediterranean ports of southern Europe. The towns of Italy, Greece and southern France have been almost as

greatly disappointed in their expectations of becoming trade centres, as in their hopes of controlling the shipping trade to the East through the operation of the Suez Canal. To be sure there has been a heavy increase in Indian exports to Italy, Austria and Russia; and the Mediterranean ports, notably Genoa, have increased in importance. But the most striking features of the change in the direction of Indian exports lies in the increased traffic to France, Holland, Belgium, and, above all, to Germany. The statistics of Indian exports to these countries\* show that there is no longer any one country pre-eminent as a distributing point for eastern produce, but that all Europe trades directly with the East. Nevertheless, with this great change in the character of the Indian export trade, the imports of European goods to India continue, as in the days before the canal, to come almost entirely from England.

The termination of the warehouse distribution system of England was one of the forces which led to the disappearance of the class of merchant princes, who had hitherto monopolized the Eastern trade. The system of bank discounts and commercial loans, by enabling men of ability to secure capital at low rates of interest, also played a large part in driving out of trade the old houses doing business on their own capital, from which they expected large rates of interest. But as long as large stocks of goods had to be kept on hand for six months or more at a time, it was difficult for the new business man to get the credit that would enable him to supplant the old established houses in the Eastern trade. When, however, the new route by the Suez Canal by bringing steamers into use enabled a cargo to be sold and delivered within a month after the order had been sent, the advantages on the side of the man working with borrowed capital were decisive.

As a result of the opening of the Suez Canal, sailing vessels, warehouses, merchant princes, dealers in six

\* See Table IV.

months' bills found their old occupations slipping away. The old modes and channels of business were altered and new adjustments had to be made. In the meantime, the confusion and disturbances in the business world were so great that the London *Economist* has said that they constituted one great general cause for the universal, commercial and industrial depression and disturbance of 1873.

The effect of the opening of the Suez Canal and the new route to the East on the production and marketing of eastern produce is by no means so easy to trace as the effects on the machinery of trade. If all the necessary statistical material were at hand it would be an almost endless task to disentangle from the complex results of complicated causes the exact changes that have been due to the canal. It is possible, however, to see the effects produced by the canal in the case of a few leading commodities, and in other respects the general tendency of the new route can be recognized.

A few commodities will serve to show that not every article in the eastern trade has been affected by the new route and the new methods of business brought about by it. The exports of Indian cotton have remained at about the same figure since the opening of the canal, showing that for that article the sailing vessel and the Cape route provided as cheap a road as the canal route. The exports of Indian wool and of spices have increased to some extent, but with nothing to indicate that the increase is greater than would have taken place in the ordinary development of trade. The exports of tea from India show an astonishing increase, from 11,000,000 pounds in 1870 to 120,000,000 in 1893-94. But with an article of such high value the direct effects of the canal through cheaper freight rates can have had little influence here, though indirectly the increased Indian production may be due in part to the easier communication with the west that was made possible by the canal. In the earlier arrival of the new season's teas the influence of the canal in shortening the time from India to England is clearly

evident. Tea imports to England in July, 1870, were 711,000 pounds; in July, 1871, 4,000,000 pounds; in July, 1872, 23,000,000 pounds—the enormous increase being the direct result of the use of steamers via the canal in place of sailing vessels and the long Cape voyage.

Rice is a commodity the trade in which has been subject to important changes as a direct result of the use of the canal route to the East. Rice is a staple Italian cereal, and a leading article of Italian export. It had formerly been imported into European countries by the Cape route, but by the canal route Eastern rice was enabled to reach markets in southern Europe formerly inaccessible, and even to be sold in Italy itself, much to the displeasure of the Italian producers. In the six years following the opening of the Suez Canal the export of Indian rice doubled, and has continued to increase since. It constitutes the largest single item in the export trade of India.

The creation of the wheat export trade of India is due directly to the opening of the Suez Canal route to Europe. Efforts had been made to carry wheat around the Cape, but the liability to heat during the long voyage and the loss from weevil in the cargo made all such attempts unsuccessful. The possibility of carrying wheat by the new and shorter route was soon demonstrated, and a trade was established that has grown until India has become the second wheat exporting country in the world. In 1870 the wheat exports of India were 130,000 bushels; in 1876, over 4,000,000 bushels; in 1883, 35,000,000 bushels; in 1891, 50,000,000 bushels.

Since the last date there has been a considerable decline in the extent of the export owing to poor crops, but under ordinary conditions the Indian product is an important item in the wheat market of the world. It will be observed that the great increase in this Indian export trade did not begin until after the year 1876. The extension at that time came about through the reduction in freight rates made

possible by improved steamers. It is, nevertheless, true that the establishment of the wheat export trade of India and the possibility of any such trade existing at all is to be ascribed to the Suez Canal.

Of the imports into India the direct influence of the Suez Canal seems to be striking in the case of but one commodity—petroleum from the Russian oil fields at Batoum. Before the discovery of these fields the imports of oil into India were insignificant; the value of such imports in 1869 was about \$110,000, and in 1876 had risen only to \$175,000. But when the Batoum oil fields were discovered an extensive trade to India via the Suez Canal immediately developed. In 1880 the imports of oil into India were 6,500,000 gallons, valued at \$1,360,000; in 1885 this had risen to 26,300,000 gallons; in 1890 to 51,800,000 gallons, and in 1893 to 86,600,000 gallons. For a considerable period the Indian demand absorbed more than half the total product of the Russian oil wells, and to-day it takes more than a quarter of their output. As the distance from Batoum to India around Africa is as great as that from the American oil fields, it does not seem possible that any of this Russian oil would have found its way to India by the Cape route. Some trade might have arisen by the overland route to India, which, when railroad connections from the Caspian Sea to India are complete, would have become important; but the oil imports of India as they stand to-day are made possible only by the existence of the canal route.

It may be well, while dealing with particular commodities, to note that nearly a million tons of coal are annually brought to Port Said for the steamers passing through the canal. This coal makes a considerable item in the Mediterranean trade due to the Suez Canal.

If the question be asked, what is the total significance of the Suez Canal on the production and marketing of commodities, the answer can be given only in general terms. A superficial observer might base an estimate on the increase in

Indian trade with Europe from \$280,000,000 in 1870, to \$700,000,000 in 1894. If, however, it is borne in mind that this increase has been at a less proportionate rate than that from 1850 to 1870 without the canal, and if the large extensions of the foreign trade of Australia, South África, Argentina and the United States within the last twenty years are also remembered, it must be evident that other and more general causes than the opening of the canal have affected the development in India. On the other hand, to limit the effects of the canal to those results which can be directly traced, such as the development of the trade in rice, wheat and petroleum, is to err by understatement. The greater ease of communication by the canal route has brought much more western life into personal contact with the East, and this has had much to do with the development not only of the foreign trade of the eastern countries, but also of their internal resources. One phase of this general development in which the canal has had an indirect share may be seen in the tonnage statistics of some of the eastern countries. From 1870 to 1894 the total foreign tonnage of India rose from 4,000,000 tons to 7,660,000; of Ceylon from 1,420,000 tons to 6,360,000 tons; of the Straits Settlements from 1,650,000 tons to 10,000,000 tons; of Hong Kong from 2,640,000 tons to 10,460,000 tons. How much of this increase is to be ascribed to the canal, and how much to other causes cannot be calculated or even roughly estimated. We must remain content, in this part of our inquiry, with recognizing that the canal is one of the factors in the great economic development of southern Asia.

To recapitulate: The construction of the Suez Canal has led to the immediate and rapid development of the use of steamers in the eastern trade, has brought about the disuse of most sailing vessels in that trade, has caused the decline of the warehouse distribution system of England, and the rise of a direct trade between the East and the consuming countries of Europe. The shorter and more direct route

has also made possible the wheat export trade of India, and the trade in oil from Batoum to India, and has doubled the rice exports of the latter country. The canal has also been one of many factors in other important economic changes, among which may be mentioned the crisis of 1873 and the general development of trade and industry in the East.

#### THE SAINT MARY'S FALLS CANAL.

There had been a canal around the falls in Saint Mary's River between Lake Superior and Lake Michigan, available for vessels drawing not over ten feet of water from 1856 on; but there can hardly be said to have been a ship canal until 1881 when the United States Government completed a seventeen-foot channel between the lakes, and provided a 515-foot lock with a single lift of eighteen feet for carrying vessels from the level of one lake to that of the other. The growth of the traffic through this canal led the Dominion Government to construct a canal around the Canadian side of the falls 1895, and in 1896 the United States canal was enlarged to a twenty-foot channel, and provided with an 880-foot lock.

The volume of traffic through this canal far exceeds that through the Suez Canal. In 1881 the traffic of the old Saint Mary's Falls Canal was 1,560,000 tons, as against 4,130,000 tons through the Suez Canal; but with the enlargement of the American canal a rapid increase in traffic immediately developed. By 1889 it equaled that of the Suez Canal (about 7,000,000 tons in each); in 1895 a tonnage of 15,000,000 tons went through the Saint Mary's Falls Canal, as compared with 8,500,000 tons through the Suez Canal; and in 1896 the figures for Saint Mary's Falls Canal were 16,240,000 tons. The present traffic through the American canal exceeds the total foreign trade of the port of New York, and is equal to nearly half the total volume of the foreign trade of the United States. In value the traffic through Saint Mary's Falls Canal presents less

imposing figures, though even in this respect it is by no means insignificant. The value of the freight passing through the canal in 1896 is estimated at \$186,000,000, while the Indian traffic alone through the Suez Canal is valued at \$360,000,000. Nevertheless, a trade of \$186,000,000 a year developing within the period of sixteen years may *prima facie* be expected to have had important economic effects.

As in the case of the Suez Canal the most striking results have been on the machinery of trade, the influence of the Saint Mary's Canal on the shipping industry of the Great Lakes being especially marked. It is not too much to say that the development of the carrying trade on the Great Lakes both in the number and kind of vessels used is due almost wholly to the "Soo" Canal. From 1881 to 1895 the volume of commerce through the Detroit River increased from 17,500,000 tons to 29,000,000 tons. During the same period the volume of commerce through the Saint Mary's Falls Canal increased by 13,500,000 tons, and as the larger share of the canal traffic goes through the Detroit River to Lake Erie ports the increase in the traffic through the Detroit River is seen to have been mainly in the traffic from Lake Superior made possible by the existence of the canal and locks at Sault Ste. Marie.\* This increase in traffic has meant a corresponding increase in the number of vessels in the lake carrying trade, and probably half of the 3230 vessels on the Lakes are employed in business depending on the canal. Between 1883 and 1897 the total tonnage on the Lakes increased from 720,000 to 1,410,000 tons, the increase being more than the total increase in the American merchant marine during this time. Further, while in 1883 the lake tonnage was but a sixth of the total American merchant marine, in 1897 it was nearly two-sevenths of that total.

Not only has there been this increase in traffic and shipping due to the canal, but within the last ten years there

\* The grain trade from Lake Michigan ports east has also increased.



has been a rapid and striking change in the material and structure of the ships on the Great Lakes, which could hardly have taken place had it not been for the canal. There has not been any sudden displacement of the old vessels such as was occasioned by the Suez Canal, but the new ships built for the increased traffic, and to replace those that wear out, are not sailing vessels of wood, but large steel and iron steamships, with double bottoms, water-tight compartments, triple expansion engines and modern electrical appliances. In 1870 there were 1699 sailing vessels and but 642 steamers on the Lakes; in 1897 there were 993 sailing vessels and 1775 steamers. In 1870 the average tonnage of vessels on the Lakes was 175 tons; in 1897 it was 440 tons. In 1880 a 1000-ton vessel was a rarity; in 1895 there were five lines owning together sixty steamships of from 1750 to 3000 tons.\*

The "Soo" Canal is connected in two ways with these changes in the lake shipping. In the first place, the increase in lake traffic which has necessitated large numbers of new

\*Lake vessels are now built to carry 5000 tons on a 16-foot draught, and 7000 tons on a 20-foot draught. The place of the lake tonnage in the American merchant marine is shown by the following remarks and table taken from the "Annual Report of the Commissioner of Navigation for 1897" (p. 8):

"We are almost exclusively indebted to the growth of shipbuilding on the Great Lakes for our increase in tonnage during the past ten years, as is indicated by the following table, showing our total documented tonnage by geographical districts on June 30 of each year designated:

	1897—Tons.	1887—Tons.	1877—Tons.
Atlantic and Gulf coasts, . . . . .	2,647,796	2,847,135	2,944,865
Pacific Coast, . . . . .	439,012	334,669	251,556
Total salt water, . . . . .	3,086,808	3,181,804	3,196,421
Great Lakes system, . . . . .	1,410,103	733,069	610,160
Western rivers, . . . . .	272,109	356,355	436,018
Total fresh water, . . . . .	1,682,212	1,089,424	1,046,178
Grand total . . . . .	4,769,020	4,271,228	4,242,599

"The discovery and utilization of the mineral wealth of the Great Lakes region, supplemented by timely appropriations by Congress for the improvement of navigation, have brought about a maritime growth in that portion of our country which is without parallel in maritime history. Our lake fleet alone is greater than that of any foreign nation except Great Britain or Germany."

ships, and thus hastened the introduction of larger and modern ships, has been, as we have seen, mainly in the traffic from and to Lake Superior made possible by the canal. In the second place, the iron ore from which the iron and steel ships are constructed comes from the iron mines of northern Michigan and Wisconsin, which have been made available by the canal route from the mines to the ports in the southern lakes.

The mention of these iron ores brings up the second phase of the economic effects of the "Soo" Canal,—those on the production and marketing of commodities. The case of iron and steel may well be given the first place as the largest item in the traffic through the canal. The most striking features in the iron and steel industries since 1880 have been the decline in the importance of the Pennsylvania mines, the development of the Lake Superior region, and the transfer of the manufacture of pig iron and steel from the east to the west of the Alleghenies. Several factors have served to bring about this remarkable shift. The Superior ores are of the quality available for making steel by the Bessemer process; the large deposits have made profitable the use of labor-saving machinery in mining, and the construction of special terminals for loading and unloading the ore. But an equally important factor is the low rates of freight from the mines to the manufacturing points in Ohio, western Pennsylvania and Illinois by the water route through the canal. In 1895 the rate from the mines to Erie ports was eighty cents per ton, equal to nine-tenths of a mill per ton mile. The lowest railroad rate per ton mile would equal a charge of \$2.59 a ton from Duluth to Cleveland; and as the price of red hematite ore of Bessemer quality at Cleveland in 1895 was \$2.80 a ton, the dependence of Lake Superior ore on the water route may be easily seen.

An interesting case of interacting causes is to be seen in the relation between the Lake Superior iron mines and the shipping on the Great Lakes. It was the development of

the iron mines which furnished the trade of the large steel steamships, and also the material for constructing them, while the use of the larger and better ships has lowered freight rates and still further developed the iron industry.

The development of the Lake Superior iron mines has been an important factor in causing the great reduction in the price of Bessemer steel during the last sixteen years, and it is this reduction that has made possible the largely increased use of steel in ship-building, in bridges, in heavier rails, and in the tall buildings of our large cities. Indirectly then, all these improvements have depended to a large degree on the existence of the Saint Mary's Falls Canal. The extent of this relation may be indicated in some degree by the statistics of the iron ore movement through the canal. From 1860 to 1881 the amount of iron ore passing through the canal increased from 100,000 tons to 750,000 tons per year; but since the construction of the larger lock the increase has been at a much greater rate. In 1887, 2,500,000 tons went through the canal; and for each of the years, 1895 and 1896, 8,000,000 tons. Throughout the period since 1881 the traffic in iron ore has formed about one-half the total tonnage passing through the canal. The figures for 1895 and 1896 are equal to four-fifths of the total production of the Lake Superior mines, which in turn constitutes two-thirds of the total iron ore output of the United States.\*

The most important part of the traffic through the "Soo" Canal, however, is not iron ore, but wheat and flour. The value of these items in the canal traffic is three times that of the iron ore, and equal to \$70,000,000, or more than a third of the valuation of the total commerce through the canal. In volume the traffic has grown from 3,500,000 bushels of wheat and 600,000 barrels of flour in 1881 to 63,250,000 bushels of wheat and nearly 9,000,000 barrels of flour in 1896. The last figures account for a large fraction of the 467,000,000 bushels of wheat raised in the United

\*See Table VI.

States in 1896, being in fact almost equal to that portion of the crop exported. The movement of wheat through the canal just about equals the total receipts at Buffalo and Erie.

It is not, however, possible to give the canal alone the credit for having developed this wheat trade. The production of the wheat was only made possible by the construction of railroads through Minnesota and the Dakotas, and these same railroads provide a means of getting the wheat to market via Chicago. But, if all-rail rates had to be paid Minnesota and Dakota wheat and flour could not compete so well with that from the country near the eastern markets, as it does by having water rates from Duluth to Buffalo. It should also be borne in mind that railroad building in Dakota and Minnesota began on a large scale only after the enlargement of the canal, when it was seen that they could connect with a through direct water route to Buffalo. The canal has therefore been an important factor in developing wheat production in the country west of Lake Superior.\*

Besides wheat there has been a considerable traffic in other grain, but this first assumed large dimensions in the year 1896 when 27,000,000 bushels of grain other than wheat went through the canal, as against 8,000,000 bushels in the previous year. As yet this is a less important item than that of wheat, but the relations between the canal and the development of the traffic are the same in both cases.

The same relations can also be traced in the development of the lumber traffic. This grew from 82,000,000 feet in 1881 to 685,000,000 feet in 1896. As in the case of wheat a considerable increase would have resulted from the construction of railroads, but the construction of railroads has been hastened and increased by the existence of the water route to the east through the canal, and it is only by cheap water rates that such a huge traffic has been developed. If, however, the cutting down of forests is the true explanation

\*See Table VI.

of the destructive spring floods in the Mississippi Valley the encouragement given to the lumber traffic by the canal may not after all have been of economic advantage to the country as a whole.

The other important item in the south-bound traffic through the canal does not seem to have been dependent on the canal. The amount of copper going by this route increased from 29,000 tons in 1881 to 116,000 tons in 1896; but the cheaper freights made possible by the canal can have had little effect in promoting the production of an article valued at \$200 a ton.

Of the north-bound traffic the only item of large dimensions is that of coal. In 1881, 295,000 tons of coal passed through the canal; in 1896, over 3,000,000 tons. The whole of this traffic may be said to have been created by the canal. The lowest railroad rates would be too high to allow any coal to be carried to the country around Lake Superior, but the lake steamers, going back empty for their cargoes of iron ore and wheat, can afford to carry coal at rates which seem incredible. In 1890, the average freight rate on coal from Buffalo to Duluth was thirty cents a ton, and for part of the time it was only ten cents a ton. It is through such rates that the northward movement of coal and the consequent development of a large iron manufacturing industry near the ore mines are made possible.

The geographical changes in production that have resulted from the operation of the Saint Mary's Falls Canal have been accompanied by important movements of population. A definite connection can be shown between the canal and certain particular population movements, but with other changes the canal has been only one of several factors. The increase of population around the shores of Lake Superior may fairly be ascribed to the development which has been given to that country, by the canal. Taking the counties bordering on Lake Superior, we find that from 1880 to 1890 the population of the Michigan counties increased from 61,750

to 116,600; of the Wisconsin counties, from 8000 to 41,000, and of the Minnesota counties, from 6400 to 54,700. The total increase is not a startling figure in the United States, but compared with the percentage increase in these same states as a whole the result is striking. During the decade the population of Michigan and Wisconsin increased in each case about 27 per cent, and of Minnesota about 70 per cent; in the Lake Superior counties the per cent of increase was, in Michigan 90 per cent, in Wisconsin 400 per cent, and in Minnesota 800 per cent. The only explanation of the difference is that new lines of industry have been opened up by the larger "Soo" Canal. One conspicuous feature of this increase of population in the Lake Superior region is the development of cities. Of the total increase of 136,000, 72,000 occurs in the six cities of Duluth, Superior, Ishpeming, Ashland, Marquette and Iron Mountain. Duluth, from a town of 3500 in 1880, had become a city of 33,000 in 1890, and six years later had a population of 60,000. Ishpeming increased during the ten years from 6000 to 11,000; Superior from 4700 to 9000; while the other three places were not in existence in 1880, but had populations between 8500 and 12,000 in 1890.

Among the movements of population where the effects of the "Soo" Canal have been greater but are not so exactly calculable, may be mentioned the settlement of the Red River Valley and the increase in the cities on and near the southern shores of Lake Erie. The first of these is connected directly with the development of wheat production in that region, in which, as has been seen, the canal had a most important influence. The second is due, in large part, to the development of the iron and steel manufacturing industries, brought about by the use of iron ore from the Lake Superior region.

A comparison of the influence of the Saint Mary's Falls Canal with that of the Suez Canal, shows that both have led to a rapid change in the material and character of ships used, that brought about by the Suez Canal being the most

important, both in the extent of new shipping and in the consequent dislocation of old forms of industry. Both canals, too, have led to important changes in the sources of production of several commodities, and the effects of the American canal on iron and wheat production are greater than any effects traceable to the Suez Canal. In the case of the more general changes in which the extent of the influence of the canals cannot be measured, no accurate comparison between the two is possible, but considering the greater area and population in Asia affected by the Suez Canal, it is evident that its influences on general development have been greater.

Both canals have led to the production of wheat on a large scale in areas hitherto unused for that purpose, these districts constituting a large part of the total increase in the area devoted to wheat production. In consequence of this total increase of wheat raising area during the last fifteen years, and the cheaper transportation to European markets, there has been a large reduction in the normal price of wheat. Cheaper food and less distress from famines and the fall in prices received by farmers in the old wheat producing districts have been due in no small degree to the canals.

*New York City.*

J. A. FAIRLIE.

TABLES.

I.

	Date Opened.	Length.	Breadth		Depth of Channel.	Locks.		Total Excavation.	Expense of Construction.
			Water Level.	Bot- tom.		Number.	Lock- age.		
		Miles	Ft.	Ft.	Ft.			Cubic Yards.	
1. Helder (Holland) Canal .	1826	50½	110	30	18	0	..		
2. Suez Canal . . . . .	1869	100	196	72	26	0	..	100,000,000	\$80,000,000
3. Second Amsterdam Canal .	1876	15½	..	88½	23	0	..	..	15,000,000
4. St. Mary's Falls Canal . . .	1881	1½	..	80	17	1	18	..	2,000,000
<i>Ibid</i> enlargement . . . . .	1896	1½	..	100	20	1	18	..	4,750,000
5. Welland Canal . . . . .	1887	27	..	..	14	26	327	..	24,000,000
6. Corinth Canal . . . . .	1893	4	92	52	28	0	..	11,000,000	12,000,000
7. Manchester Canal . . . . .	1894	35	..	120	26	5	60	50,000,000	75,000,000
8. North Sea—Baltic Canal .	1896	61½	..	67	28	2	..	100,000,000	40,000,000

*II.—Tonnage of Shipping Entering and Clearing at Amsterdam and Rotterdam.*

YEAR.	AMSTERDAM.				ROTTERDAM.			
	Entered.		Cleared.		Entered.		Cleared.	
	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.
1856 . . .	1596	401,961	1458	279,208	2254	532,401	1837	461,340
1860 . . .	1997	411,175	1472	277,527	2369	666,431	2046	597,145
1870 . . .	1330	405,498	808	225,958	2871	1,125,124	2368	955,375
1876 . . .	1171	391,553	1248	410,168	3443	1,406,044	3786	1,524,820
1877 . . .	1517	604,179	1527	608,094	3266	1,386,779	3410	1,437,241
1882 . . .	1632	877,182	1628	856,084	3859	2,002,439	4002	2,047,337
1887 . . .	1473	921,140	952	579,466	3853	2,386,748	2754	1,412,460
1891 . . .	1569	1,051,526	1027	632,821	4208	2,865,185	2686	1,400,993
1895 . . .	1512	1,109,082	1138	743,754	4442	3,759,480	2764	1,653,136

Compiled from "*Staatkundig en Staathuishoudkundig Jaarboekjen.*"

*III.—Traffic through Suez and St. Mary's Falls Canals.*

YEAR.	ST. MARY'S FALLS CANAL.		SUEZ CANAL.		
	Ships.	Tonnage.	Ships.	Tonnage.	Tonnage from India.
1855 . . . . .	..	106,296*	..	..	..
1860 . . . . .	..	403,657	..	..	..
1865 . . . . .	997	409,062	..	..	..
1870 . . . . .	1,828	690,826	486	436,609	..
1871 . . . . .	1,637	751,101	765	761,467	464,198
1872 . . . . .	2,004	914,735	1082	1,160,743	626,824
1873 . . . . .	2,517	1,204,446	1173	1,367,767	816,527
1874 . . . . .	1,734	1,070,857	1264	1,631,650	1,133,968
1875 . . . . .	2,033	1,259,534	1494	2,009,984	1,440,270
1876 . . . . .	2,417	1,541,676	1457	2,006,771	1,518,690
1877 . . . . .	2,451	1,439,216	1663	2,355,447	1,617,839
1878 . . . . .	2,567	1,667,136	1593	2,269,678	1,426,957
1879 . . . . .	3,121	1,677,071	1477	2,263,332	1,609,769
1880 . . . . .	3,503	1,734,890*	2026	3,057,421	2,133,872
1881 . . . . .	4,004	1,567,741*	2727	4,136,729	2,887,988
1882 . . . . .	4,774	2,029,521*	3198	5,074,808	2,586,920
1883 . . . . .	4,315	2,267,105	3307	5,775,861	3,151,792
1884 . . . . .	5,689	2,874,557	3284	5,871,500	2,817,551
1885 . . . . .	5,380	3,256,628	3624	6,335,752	3,058,641
1886 . . . . .	7,424	4,527,759	3100	5,767,655	2,946,650
1887 . . . . .	9,355	5,494,649	3137	5,903,024	3,045,735
1888 . . . . .	7,803	6,411,423	3440	6,640,834	3,113,957
1889 . . . . .	9,579	7,516,022	3425	6,783,157	3,055,364
1890 . . . . .	10,557	9,041,213	3389	6,890,094	3,308,516
1891 . . . . .	10,191	8,888,759	4207	6,698,777	4,431,824
1892 . . . . .	12,580	11,214,333	3559	7,712,928	5,525,259
1893 . . . . .	12,008	10,796,572	3341	7,659,068	3,563,310
1894 . . . . .	14,491	13,195,860	3352	8,039,175	..
1895 . . . . .	17,956	15,062,580	3434	8,448,383	..
1896 . . . . .	18,615	16,239,061	3109	8,594,307	..

\* Before 1881 the figures for St. Mary's Falls Canal are gross tons; after 1881, and all figures for Suez Canal, are net tonnage.



IV.—*Values of Indian Exports by Countries.*

(In tens of rupees.)

COUNTRIES.	1870.	1876.	1883-4.	1893-4.
United Kingdom . . . . .	27,798,698	28,881,699	39,057,340	37,167,329
France . . . . .	4,227,279	4,608,359	8,368,522	10,727,206
Germany . . . . .	77,101	139,948	616,352	7,643,508
Belgium . . . . .		137,271	3,403,359	5,726,272
Holland . . . . .		183,421	340,426	1,482,370
Spain . . . . .			226,861	452,787
Italy . . . . .	1,020,249	1,223,814	3,520,741	3,574,420
Austria . . . . .		1,410,295	2,252,389	2,988,164
Russia . . . . .		511,620	149,635	665,327
Egypt . . . . .		204,688	3,598,954	3,722,692
Mauritius . . . . .	474,333	1,209,643	902,052	1,441,458
Aden and Arabia . . . . .	521,624	1,224,814	1,399,259	2,252,627
Ceylon . . . . .	1,930,089	2,689,048	1,965,676	3,679,870
China . . . . .	12,501,426	11,520,414	13,201,865	11,290,966
Japan . . . . .		6,125	287,870	1,419,369
Persia . . . . .	1,463,454	618,973	1,475,672	1,990,510
Straits Settlements . . . . .	1,321,902	2,642,797	3,088,327	5,018,822
United States . . . . .	1,516,922	1,778,409	3,102,689	3,359,821
Total Exports . . . . .	53,496,762	56,839,851	89,102,868	110,472,327
Exports via Suez Canal . . . . .		22,188,108	50,376,033	69,793,888

Compiled from Statistical Reports of India in British Parliamentary Papers.

V.—*Leading Articles of Indian Foreign Trade.*

		1870.	1876.	1883-4.	1893-4.
<i>Exports.</i>					
Cotton . . . . .	Cwts. .	4,953,879	5,010,785	5,987,278	4,794,152
Rice . . . . .	Cwts. .	10,614,644	20,416,032	27,039,359	24,649,723
Wheat . . . . .	Cwts. .	78,208	2,510,768	21,001,412	12,156,851
Hides and Skins . . . . .	No. . .	13,675,997	19,444,133	28,183,506	36,216,806
Jute Bags . . . . .	No. . .	6,441,863	19,258,250	63,645,984	131,266,827
Jute Cloth . . . . .	Yards .		3,921,065	7,049,165	60,670,094
Seeds . . . . .	Cwts. .	4,379,781	10,507,404	17,357,884	24,238,605
Spices . . . . .	Lbs. . .	19,351,360	25,266,851	18,514,377	24,347,989
Tea . . . . .	Lbs. . .	11,480,213	24,561,826	60,473,113	120,907,616
Wool . . . . .	Lbs. . .	20,392,634	24,138,636	25,235,180	36,821,308
<i>Imports.</i>					
Cotton Goods . . . . .	Yards .	919,636,793	1,187,150,170	1,724,095,627	2,129,704,904
Petroleum Oils . . . . .	Gals. .	500,000	800,000	13,107,267	86,611,933
Silk Manufactures . . . . .	Yards .	2,778,143	8,111,562	11,550,961	16,418,727
Woolens . . . . .	Yards .	4,886,887	7,233,629	9,316,192	15,054,352

## VI.—Wheat and Iron Ore Production in the United States.

STATES.	WHEAT (BUSHELS).				IRON ORE (TONS).		
	1870	1880	1890	1893	1880	1889	1895
New York . . . .	12,178,462	11,587,766	8,304,539	6,846,059	1,126,899	1,247,537	307,256
New Jersey . . .	19,672,967	19,462,405	21,595,499	18,351,508	676,225	415,510	282,433
Pennsylvania . .	27,882,150	46,014,869	35,559,208	38,916,608	1,951,496	1,560,234	900,340
Ohio . . . . .	27,747,222	47,284,853	37,318,798	35,579,404	488,753	254,294	44,834
Indiana . . . . .	30,128,405	51,110,502	37,389,444	15,507,313	..	..	..
Illinois . . . . .	29,435,692	31,154,205	8,249,786	6,749,224	..	..	..
Iowa . . . . .	14,315,926	24,966,627	30,113,821	15,507,313	..	..	..
Missouri . . . .	2,391,198	17,324,141	30,399,871	23,251,973	..	..	..
Kansas . . . . .	16,265,773	35,532,543	24,771,171	19,920,714	1,640,814	5,856,169	5,812,444
Michigan . . . .	25,606,344	24,884,689	11,698,922	8,664,485	37,000	837,399	649,351
Wisconsin . . . .	18,866,073	34,601,030	52,300,247	30,694,685	..	864,508	3,866,453
Minnesota . . . .	..	..	{ 16,541,138	20,521,389	..	..	..
South Dakota . .	170,662	2,830,289	{ 26,403,365	26,438,208	..	..	..
North Dakota . .	..	..	468,373,968	496,131,725	..	..	..
United States . .	287,745,626	459,483,137	..	..	7,120,362	14,518,041	15,957,614